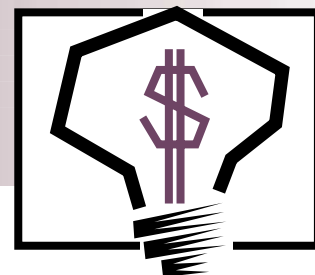


INVENTIONS & INNOVATION

Success Story



HYDRAULIC TEST UNITS AND PLUGS

New Hydraulic Test Unit Used to Evaluate Heat Exchanger Tube Integrity

Benefits

- ◆ Thirty utilities in the United States over the last ten years have avoided the purchase of an average of 960 MW of replacement power per day of forced outage
- ◆ The system produces significant energy savings by eliminating forced outages that require power to be purchased from less efficient or more expensive sources
- ◆ Mechanical seal plugs are installed quickly plus they are fully removable and reusable
- ◆ Repairing shell-and-tube heat exchangers instead of prematurely replacing them avoids sending debris to the landfill or using virgin materials

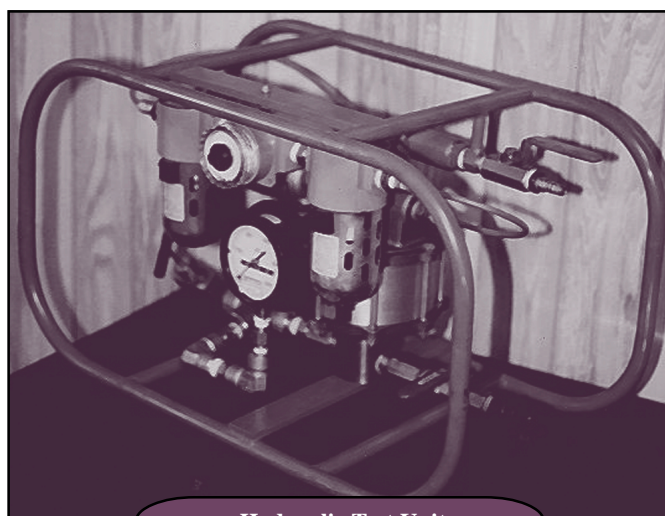
Applications

High-pressure testing of tubes in shell-and-tube heat exchangers in power plants or process industry.

Tube failures in feedwater heaters are a significant problem for utilities. If a heat exchanger tube fails in a nuclear or fossil power plant, the steam generator and turbines can potentially be damaged from leaks. If a feedwater heater is repaired while the power plant is on line, the power plant has to reduce generator load or shutdown and purchase replacement power during the repair.

The main objective of feedwater heater maintenance is to prevent leakage or to stop leakage as soon as possible. To achieve this end, the Powerfect hydraulic test unit and seal plugs, commercialized with assistance from DOE's Inventions and Innovation Program, offer real benefits during forced or limited heat exchanger outage situations. Powerfect's hydraulic testing equipment allows individual tubes inside any shell and tube heat exchanger to be tested. Weak tubes will be identified or fail during the test rather than when they are in service, thereby avoiding expensive forced or limited outages.

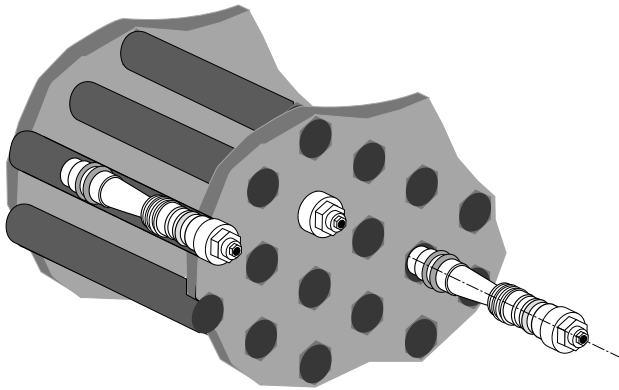
The hydraulic test unit imposes hydrostatic pressure on the heat exchanger tubes. Two hydraulic test systems are available: a low-pressure testing system designed for applications up to 2,000 psig and a high-pressure testing system designed for applications up to 10,000 psig. The Powerfect plug is used to plug leaking tubes, after they have been identified by the hydraulic test unit. The elastomer seal compound used in the plugs has withstood years of operation in high-pressure/high-temperature service.



Hydraulic Test Unit



Powerfect Seal Plugs

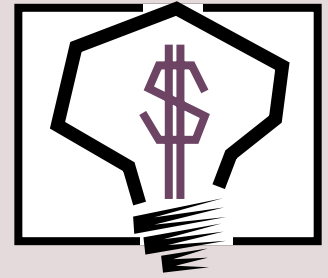


Powerfect sells the hydraulic test units, but sometimes utilities prefer to have Powerfect bring in the test unit and test the heat exchangers. Then, the utilities purchase seal plugs to repair the heat exchangers. Powerfect services utilities all over the world, including the United States, Canada, the United Kingdom, and Taiwan. Approximately 600 heat exchangers have been serviced over the last ten years; 90% of which were in the United States and most of which were feedwater heaters. Over 30 utilities (45 Plants) have used this technology in the United States and 7 utilities (11 plants) in Canada. More than 8000 seal plugs have been sold over the last 10 years.

By identifying weak tubes on the verge of failure, the Powerfect hydraulic testing system produces significant cost saving by eliminating forced outages that require power to be purchased from less efficient or more expensive sources. The replacement power can cost from \$100 to \$1000 per MW depending on time of year and where it is being purchased. If a high-pressure feedwater tube failure results in a generator load reduction on derate, the average amount of replacement power required is about 40 MW. When heat rate penalties and fuel losses are included, a feedwater heater out of service for one week could cost several hundred of thousand dollars, which almost equals the purchase price of a new feedwater heater.

INVENTIONS AND INNOVATION PROGRAM

The Inventions and Innovation Program provides financial assistance for establishing technical performance and conducting early development of innovative ideas and inventions. Ideas that have a significant energy-savings impact and future commercial market potential are chosen for financial support through a competitive solicitation process. Inventions funded by the program have saved enough energy to light 10 million homes per year. In addition, the program offers technical guidance and commercialization support to successful applicants. Ideas that benefit the Industries of the Future, designated by the Office of Industrial Technologies as the most energy-intensive industries in the United States, are especially encouraged.



"The I & I grant allowed Powerfect to expand the commercial use of tester and plugs to a broader range of applications."

— Michael Catapano
President
Powerfect, Inc.

Project Partners

◆ Inventions and Innovation Program
Washington, DC

◆ Powerfect, Inc.
Livingston, NJ

For project information, contact:

Michael Catapano

or

Mary Jane Luddy

Powerfect, Inc.

9 Great Meadow Lane,

East Hanover, NJ 07936

Mailing Address:

P.O. Box 375,

Livingston, NJ 07039

Phone: (973) 503-0321

Fax: (973) 503-0664

powerfect@aol.com

Visit our home page at

www.powerfect.com

For more information about
the Inventions and Innovation
Program, contact:

Lisa Barnett

Program Manager

Inventions and Innovation Program

U.S. Department of Energy

1000 Independence Avenue SW

Washington, D.C. 20585-0121

Phone: (202) 586-2212

Fax: (202) 586-7114

lisa.barnett@ee.doe.gov

Visit our home page at

www.oit.doe.gov



Order # I-OT-398

July 2001